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| 09/825,870      | 04/05/2001  | Leonid Grigorian     | 052833-5004         | 3120             |

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EXAMINER

LISH, PETER J

ART UNIT PAPER NUMBER

1754

DATE MAILED: 01/10/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/825,870

Applicant(s)

GRIGORIAN ET AL.

Examiner

Peter J. Lish

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1754

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 04 November 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-18 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.

- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

**DETAILED ACTION*****Response to Arguments***

Applicant's arguments, see appeal brief, filed 11/4/05, with respect to the rejections over reference to Xu et al. have been fully considered and are persuasive. This non-final rejection is to be considered a re-opening of prosecution in response to the applicant's arguments. The rejections of the previous office action have been withdrawn. It is noted that Xu et al. produce nanotubes having diameters between 20 and 200 nm. Although the reference may cite the production of single-shell fibers, the diameters of the fibers of Xu et al. would exclude the production of single-walled nanotubes.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-3 and 6-7 are rejected under 35 U.S.C. 102(e) as being anticipated by Margrave et al. (US 2001/0031900 A1).

Margrave et al. teaches a process for the growth of single-walled carbon nanotubes using chemical vapor deposition. The nanotubes are grown on a supported catalyst, which may

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comprise iron using a carbon-containing gas, which may include methane (paragraph 55). The growth conditions include a temperature between about 400 and 1200 °C and a preferred pressure between 400 and 600 torr (paragraph 61). The process may also employ a sweep gas consisting of argon, helium, and mixtures thereof in various partial pressures (see also paragraphs 175-191). No difference is seen between the process of Margrave et al. and that of the instantly claimed invention.

Claims 1-4 and 6-7 are rejected under 35 U.S.C. 102(b) as being anticipated by Smalley et al. (US 6,692,717).

It is noted that the PCT publication date is used as the basis for the 102(b) rejection. Smalley et al. teaches a process for the growth of single-walled carbon nanotubes using chemical vapor deposition. The nanotubes are grown on a supported catalyst, which may comprise iron, cobalt, molybdenum, and mixtures thereof supported on alumina (col. 6). The carbon-containing gas may include methane (col. 7). The growth conditions include a temperature between about 600 and 900 °C and a typical pressure between about 500 and 2000 torr (col. 9, lines 5-16). The example shows the use of a catalyst comprising a mixture of iron and molybdenum supported on alumina in various ratios, such as a 10:1:1/9 ratio of  $\text{Al}_2\text{O}_3\text{:Fe:Mo}$ , as well as the use of an argon carrier gas (example). No difference is seen between the process of Smalley et al. and that of the instantly claimed invention.

Claims 9, 11-13, and 17-18 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Smalley et al.

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Smalley et al. is applied above. Smalley et al. does not specifically teach the single-walled nanotube diameter distribution using the specific reaction conditions as claimed.

However, because no difference is seen between the process of Smalley et al. and that of the instantly claimed invention, it is expected that the nanotube product of Smalley et al. meet the claimed properties.

Where, as here, the claimed and prior art products are identical or substantially identical, or are produced by identical or substantially identical processes, the burden of proof is shifted to the applicant to prove that the prior art products do not necessarily or inherently possess the characteristics of his claimed product. See *In re Best*, 195 USPQ 430.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Margrave et al.

Margrave et al. is applied above. Margrave et al. does not explicitly teach the volume ratio of methane to sweep gas, however Margrave et al. does teach the use of a large range of partial pressures of methane in the gas mixture. It therefore would have been obvious to one of ordinary skill at the time of invention to use a gas ratio within the claimed range in the process of Margrave et al. in order to achieve a desired partial pressure of methane.

Claims 5, 8, 10, and 14-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Smalley et al.

Smalley et al. is applied to claims 1, 9, and 13 above. Regarding claims 5, 10, and 14-16, the exact ratio of iron, cobalt, molybdenum, and alumina materials in the catalyst is not specifically taught. However, it would have been obvious to use a ratio of elements, as claimed, as doing so is seen to be the optimization of a known process, which could have been determined through routine experimentation and is held to be obvious to one of ordinary skill in the art, *In re Boesch*, 205 USPQ 215.

Regarding claim 8, Smalley et al. does not explicitly teach the volume ratio of methane to carrier gas, however Smalley et al. does teach the use of various partial pressures of carbon-containing gas in the gas mixture in order to control nanotube growth. It therefore would have been obvious to one of ordinary skill at the time of invention to use a gas ratio within the claimed range in the process of Smalley et al. in order to achieve a desired partial pressure of methane.

Claims 5, 10, and 14-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Smalley et al. as applied to claims 1, 9, and 13 above, and further in view of Resasco (US 6,413,487).

Smalley et al. does not explicitly teach the exact ratio of iron, cobalt, molybdenum, and alumina materials in the catalyst. Resasco teaches that the ratio of the Group VIII metal(s) to the Group VIb metal is preferably from about 1:10 to about 15:1. Further, the total amount of bimetallic catalyst deposited on the support may vary widely, but is generally in an amount of

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from about 1% to about 20% of the total weight of the metallic catalytic particle (column 8, lines 1-5). Given the teaching of Resasco et al., it would have been obvious to one of ordinary skill at the time of invention to use the claimed ratios of the applicant. Additionally, the use of specific catalyst ratios is viewed to be the optimization of a known process, held to be obvious by *in re Boesch* (205 USPQ 215) unless significantly different and unexpected results are shown.

### ***Conclusion***

The following prior art made of record and not relied upon is considered pertinent to applicant's disclosure. US 6,716,409.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Peter J. Lish whose telephone number is 571-272-1354. The examiner can normally be reached on 9:00-6:00 Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley Silverman can be reached on 571-272-1358. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

PL

  
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